cause immediate or eventual reliability problems or failure of the circuit. From Summary of the Invention, page 4, line 16. The limitation "little or no differential strain between the substrate and said layer occurs in the normal operating temperature range of said integrated circuit" should be interpreted in accordance with this passage, and that should give the limitation suitable clarity.

The breadth of a claim should not be equated with indefiniteness. In re Miller, 441 F.2d 689, 169 USPQ 597 (CCPA 1971). If the scope of the subject matter embraced by the claims is clear, and if the applicant has not otherwise indicated that the invention is to be of different scope from that defined in the claims, then the claims comply with Section 112, Second Paragraph. Donner, *Patent Prosecution: Practice and Procedure Before the U.S. Patent and Trademark Office*, Chapter 9, Page 570 (BNA Books 1996). The fact that claim language includes words of degree, or relative terms that may not be precise, does not automatically render the claim indefinite under Section 112, Second Paragraph. *Id.* at page 597-98; Seattle Box Co. v. Industrial Crating & Packing, Inc., 731 F.2d 818, 221 USPQ 568, 573-4 (Fed. Cir. 1984). Definiteness of the claim language turns on whether persons skilled in the art would understand what is claimed, in light of the specification. *Id.*

Here, the limitation is question is "a layer of silicon dioxide or silicon nitride having a thickness such that little or no differential strain between the substrate and said layer occurs in the normal operating temperature range of said integrated circuit". This limitation, when interpreted in light of the specification, makes it clear that what is being claimed is that the thickness of the layer of silicon dioxide or silicon nitride is picked to be a value such that the layer has a specific property. That property is that the differential strain between this layer and the substrate is not so high as to cause cracking of the layer of oxide or nitride or other failure of the structure which will render the device

inoperative when the device is operating anywhere within its designed operating temperature range. This is sufficiently clear to those skilled in the art and is as clear as the nature of the subject matter permits since the thickness of the layer depends upon the thermal coefficient of expansion of the material chosen for the substrate and the material chosen for the layer of dioxide or nitride and upon the design temperature range. The chosen limitation is clear enough to define the outer perimeter of the territory claimed, and it would be an injustice to force the applicant to claim specific thicknesses or materials or specific strain levels since a broad range of thicknesses will be covered based upon all the factors defined above. The chosen language is believed to be as specific as it can be given the fact that the limitation is result oriented. Any thickness and material choice will work so long as, given the substrate material and operating temperture range and the material type of the layer of oxide or nitride, no cracking or other structural failure at any temperature in the design range occurs.

In a sense, the "little or no differential strain... occurs" limitation is a functional limitation which attempts to define the structure by what it does rather than what it is. It is well established that functional limitations my be used in claims without causing indefiniteness to define a structure by what it does rather than what it is, and there is nothing inherently wrong with this. Donner, at page 585; In re Swinehart, 439 F.2d 210, 169 USPQ 226, 229 (CCPA 1971). A functional limitation is evaluated for indefiniteness just like any other limitation -- for what it conveys to those skilled in the art. Here, those skilled in the art easily can ascertain that the material and thickness of the layer of oxide or nitride must be chose relative to the thickness and material of the subtrate so as to cause little or no different strain between the substrate and the layer over the design operating temperature range.

With regard to the Examiner's rejection of claims 1-3 on grounds that "the normal

temperature range" limitation is unclear, please consider the following. The claimed apparatus is an RFID tag or smart card. The range of temperatures in which smart cards operate is typically fairly limited to the temperatures a human being can withstand. However, the temperature ranges encountered by RFID tags can vary wildly depending upon the application. For example, some RFID tags are put in or on products that enter ovens such as semiconductor wafers or are embedded inside tires which get hot when carrying heavy loads at high speeds. Other RFID tags are put in or on products which are refrigerated or which are used in artic regions. Therefore, there is no normal operating temperature range for RFID tags in general -- what is normal depends completely upon the application to which the tag will be put. But the invention is not in the temperature range the tag will be used in but in the structure of the tag that makes it inexpensive to make yet reliable for whatever temperatures the tag might encounter in post manufacture use. The structural limitations that make the tag inexpensive to make are the fact that it is made on inexpensive substrates such as plastic, glass or plastice laminated to glass substrate and there is a layer of silicon dioxide or silicon nitride which is selected to have a thickness such that when any temperature within whatever the normal operating temperature range is is reached by the RFID tag, the amount of expansion (or other changes in size) of the substrate relative to the amount of expansion (or other changes in size) of the layer of oxide or nitride is not so different as to cause cracking. In other words, the differential strain anywhere in the normal temperature ranges is not so great as to cause cracking or failure of the structure that will render the device inoperative.

This "normal operating temperature range" limitation must be evaluated for indefiniteness in light of what is suggests to those skilled in the art and whether that is definite. Clearly, persons skilled in the art of designing RFID tags and smart cards know

they are designed for particular applications, each of which will have a normal operating temperature range. What that range is cannot be known in advance unless the application to which the RFID tag is put is known in advance. To force the applicant to specify a specific temperature range would be to unduly narrow the claim and preclude the structure from being reliable in some other more extreme temperature range where the thickness of the oxide or nitride layer might be not correct and excessive differential strain would result in failure of the tag or smart card. In short, no particular specific temperature range can be defined in the claim without overly limiting the claim and possibly rendering the structure unreliable for applications where normal operating temperatures would include temperatures outside the specified range. The chosen language is as specific as it can be given the nature of the invention, and it clearly suggests to those skilled in the art the limits of the invention.

With regard to the Examiner's rejection of claim 3 on grounds that the limitation "a very large number of said integrated circuits" is indefinite, the claim has been amended to remove the offending limitation. The term large has also been removed also since the Examiner might find that term indefinite.

With regard to the rejection of claim 1 and claim 3, line 8, the Examiner's suggested language has been adopted.

Novelty Rejection

The Examiner has rejected claim 1 as anticipated by Tuttle, US 6,375,780. In response thereto, claims 1 has been amended to specify that the thickness of the oxide or nitride layer is selected such that little or no differential strain between the substrate occurs at any temperatur in the normal operating range. The Examiner cites to Col. 13, lines 19-28 of Tuttle as a teaching of the limitation from claim 1:

a layer of silicon dioxide or silicon nitride having a thickness such that little or no

> differential strain between the substrate and said layer occurs at any temperature in the normal operating temperature range of said integrated circuit;

This reads into Tuttle teachings that are not there. The Examiner is respectfully requested to withdraw the anticipation rejection based upon the following argument. Tuttle teaches an RFID tag which is assembled by hand (Col. 9, lines 48-49). In the embodiment of Figures 6A-6E, an integrated circuit 96 with transceiver circuitry is glued with conductive epoxy to the top plate 90 of a parallel plate capacitor which is itself glued by a conductive epoxy to a thin film battery 84, 88. All this is described at Col. 9, lines 33-47. The thin film battery is placed on a thin polymer base layer 78 which is laminated with a metal film or nitride or PVDC.

Why this laminate is used is explained in connection with the description of the process flow of Figure 13 used to build the embodiment of Figures 10-12. Col. 12, lines 56-65 explains that the polyester film is inexpensive, but is porous to materials that can degrade the life of the battery or integrated circuit. To prevent this, a barrier material such as silicon nitride is deposited on the outer surface of the polyester film by sputtering or chemical vapor deposition. This barrier provides a hermetic seal and barrier to prevent water vapor or other contaminents from oxidizing the battery and transceiver components. Col. 12, line 66 to col. 13, line 4. At Col. 13, lines 4-28, Tuttle teaches that the barrier layer is 400 to 10,000 angstroms thick but that thinner deposits on both sides of the film can be used. Signifcantly, Tuttle teaches:

> The thickness of the deposit and the manner of formation are design choices based on the selection of materials for the film and the deposit, as well as the system requirements for hermeticity over time. For example, an alternate and equivalent embodiment uses other barrier materials including silicon oxide and silicn nitride deposited at a thickness of 100 to 400 angstroms. The barrier material is formed in such an embodiment using one of the processes including evaporation, deposition, chemical vapor deposition, and plasma enhanced chemical vapor deposition. In another embodiment of the present invention, a nitride film is sputtered on the outside portion of a top and bottom base support layer. Each based support layer preferably comprises a polymer material such as

> a polyester film that is laminated with a barrier layer material such as polyethylene and/or polyvinylidenechloride (PVDC). Formation of the barrier material deposit can be deferred until the enclosed transceiver is encapsulated , provided that environmental concerns such as contamination, over heating, and changes in pressure are addressed.

This passages does not teach that the layer of barrier material is oxide or nitride which has its thickness selected such that little or no differential strain occurs between the substrate polymer and the barrier layer of oxide or nitride of PVDC at any temperatures in normal operating range that the RFID tag will encounter. The problem of differential strain at extreme temperatures and the possibility of cracking is not recognized in Tuttle. Tuttle uses the barrier layer of oxide or nitride to establish hermeticity to prevent water vapor or other contaminants from penetrating the polymer film and oxidizing the battery. The possibility of encountering extreme temperatures and resulting failure from cracking caused by differential strain between the substrate and the barrier layer is not mentioned anywhere in Tuttle. Because this problem is not recognized by Tuttle, Tuttle contains no teachings which provide a solution to this problem. As such, Tuttle does not teach selecting the thickness of the barrier layer so as to minimize differential strain considering the material and thickness of the substrate and the temperatures the RFID tag will encounter. Therefore, Tuttle does not anticipate claim 1 since claim 1 contains the limitation:

> a layer of silicon dioxide or silicon nitride having a thickness such that little or no differential strain between the substrate and said layer occurs <u>at any temperature</u> in the normal operating temperature range of said integrated circuit;

Withdrawal of the anticipation rejection is respectfully requested.

Claims 2 and 3 have also been rejected as anticipated by Tuttle. Claims 2 and 3 each have the same limitation regarding the thickness of the barrier layer as claim 1, and

each has been amended in the same way as claim 1 and is therefore not anticipated by Tuttle for the reasons explained above with reference to claim 1.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to: Mail Stop Non-Fee Amendment, Commissioner of Patents and Trademarks, Post Office Box 1450, Alexandria, VA 22313-1450 on April 26, 2003.
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